

Remarks

Reexamination and reconsideration of the rejections are hereby requested.

Claims 148-151, 156, 159-161, 164, 167 and 187-192 are currently pending in this application. Claims 150 and 151 have been objected to as being dependent upon a rejected base claim but are indicated to include allowable subject matter. The remaining claims stand rejected.

The pending claims are generally directed to methods and apparatus for controlling a data storage device such as a disk drive in which quick or quiet modes may be selected. The quick mode might be selected during periods of intense data processing when the highest speed operation is required and acoustic noise is of little concern. Alternatively, the quiet mode might be selected when acoustic noise is a problem such as, for example, when the computer is in a bedroom or being used to take notes during a class. This technology is capable of providing, at a given level of quietness, a faster seek than is currently achievable with known technology. Further, this technology is capable of providing, in its quietest mode, seeks substantially as fast as current high performance seeks without the attendant high acoustic noise levels.

It has been known in the prior art for manufacturers to configure separate drives for quick or quiet operation. This approach necessitated multiple product designations and inventory requirements. In contrast to the prior art, the present invention allows a single data storage device such as a disk drive to be operated in either a quick or quiet mode as desired thus eliminating the need for multiple, differently configured disk drives.

The pending independent claims have been amended herein to state explicitly that the noise to be controlled is acoustic noise as opposed to electrical noise. In addition, claims 187, 191 and 192 have been amended to recite that the seek time and noise level of the data storage device are altered in an inverse relation.

As recited in the claims, the acoustically quiet mode is achieved by changing seek trajectory shape to reduce unwanted frequencies by shaping input signals to the data storage device. For reasons that will be discussed in detail below, it is submitted that none of the references of record anticipate or render obvious the pending claims. Reconsideration is requested.

Claims 188, 191 and 192 have been rejected under 35 USC §102(e) as being anticipated by Rowan, U.S. Patent No. 5,986,426. Rowan is directed to an adaptive pulse width modulated motor control which has application to data storage devices. This patent teaches that switching from a PWM amplifier to a linear amplifier can reduce acoustic and electrical noise generated by a spindle. Significantly, however, this patent teaches that by switching to a linear amplifier for a voice coil motor (VCM), which controls the seek operation, only electrical noise is reduced. The examiner has acknowledged this teaching in paragraph 4 of the office action. The examiner's attention is also directed to column 11, line 3 which refers to reducing the amount of electrical noise generated by head motion.

As stated above, all of the independent claims have been amended herein to state that the noise to be reduced during a seek operation is acoustic noise. Thus, as now claimed, it is the acoustic noise level of the data storage device that is controlled by changing seek trajectory shape to reduce unwanted frequencies by shaping input signals to the data storage device. In contrast, Rowan merely teaches reducing *electrical* noise during the seek operation. Further, Rowan does not teach reducing unwanted frequencies by shaping the seek trajectory. Therefore, claims 188, 191 and 192 are not anticipated under 35 USC §102(e) by Rowan because the pending claims now recite acoustic noise alteration and Rowan teaches reduction of electrical noise during a seek operation. It is requested that this rejection be reconsidered and removed.

Claims 148, 149, 156, 159-161, 164, 167, 187, 188, 189 and 190 stand rejected under 35 USC §103(a) as being unpatentable over Rowan, U.S. Patent No. 5,986,426 and Koizumi *et al.*, U.S. Patent No. 5,982,570. With respect to claims 148, 149, 167 and 188, the examiner states that Rowan uses the value stored in the control register 218 to control whether the system should be in the acoustic noise reduction mode or not. As pointed out above, however, the acoustic noise reduction taught by Rowan deals only with control of the spindle motor, not with control of seek.

Koizumi is directed to a disk drive power saving technology that teaches slowing the drive down to permit a quiet mode. The examiner states that Koizumi provides the details for changing the operating mode of a data storage device that are missing in Rowan. First, there is no suggestion to combine Rowan with Koizumi because with respect to the seek operation, Rowan addresses electrical noise, while Koizumi is concerned with acoustic noise. Second, even

if the teachings of Rowan and Koizumi were combined, the combination would merely allow a user to select, or not, the acoustic noise reduction technique of Rowan which, as discussed above, involves altering control of only the spindle motor to reduce acoustic noise. There is, therefore, absolutely no teaching or suggestion in the combined teachings of Koizumi and Rowan to alter acoustic noise level of a data storage device by changing seek trajectory shape to reduce unwanted frequencies.

Dependent claims 156, 159, 160 and 190 are allowable because they depend from allowable claims as just discussed above.

With respect to independent claims 161 and 187, the examiner asserts that Koizumi and Rowan together teach the claimed system of changing the operating mode of a data storage system. Both of these claims relate to controlling acoustic noise by altering seek trajectory shape. As stated above, the seek operation in Rowan is controlled to reduce electrical, not acoustical, noise. The same analysis also applies to independent claims 164 and 167. Reconsideration is requested.

Claims 191 and 192 stand rejected under 35 USC §102(e) as being anticipated by Zhang, *et al.*, U.S. Patent No. 6,038,096. Zhang relates to a disk drive control scheme for reducing power consumption. The technique involves slowing down track-to-track seek under certain circumstances. In particular, the seek operation is slowed down when there would be a waiting period for a target sector to arrive under the read/write head when maximum seek speed is used. This technology is for the purpose of saving power but a byproduct is reduced noise when seek speed is reduced. Claims 191 and 192 have been amended herein to recite that the seek time and noise level are altered in inverse relation. These claims are thus not anticipated because Zhang takes advantage of any dead time after a seek and teaches that access time is therefore not reduced and hence the inverse relation between noise level and seek time is not met. Further, Zhang's technique does not suggest or teach shaping seek trajectory to reduce unwanted frequencies. Reconsideration is requested.

Claims 148, 149, 156, 159-161, 164, 167 and 187-190 stand rejected under 35 USC §103(a) as being unpatentable over Koizumi *et al.*, U.S. Patent No. 5,982,570 and Zhang *et al.*, U.S. Patent No. 6,038,096. In paragraph 16 of the Office Action, the examiner asserts that one skilled

in the art would have recognized that Koizumi's acoustic noise solution is imperfect because performance is degraded. The undersigned disagrees with this assertion because Koizumi's focus is reducing power consumption and there is nothing in Koizumi that would indicate his solution to be ineffective in conserving power. Noise reduction is a mere byproduct of the power conservation technique which involves slowing down the drive. It is submitted that the examiner is using applicant's own specification which points out the degradation in seek performance in systems such as Koizumi's. See, specification at page 2, line 24.

The examiner also notes that "Koizumi reduced the spindle speed to achieve the quiet mode." Thus, there would be no motivation to combine Koizumi with a reference that modifies the seek operation as opposed to spindle speed to reduce noise. Zhang, as discussed earlier, teaches a system which, under certain circumstances, slows down the seek speed to save power that can result in a quieter operation. Zhang does not, however, teach to alter seek trajectory to reduce unwanted frequencies by shaping input signals. Thus, it is submitted that there is no teaching, suggestion or motivation to combine Koizumi with Zhang, and even if such motivation were present (which it is not), the combined teachings do not suggest changing seek trajectory shape to reduce unwanted frequencies by shaping input signals to a data storage device.

In *In re Dembiczak*, 50 U.S.P.Q.2d, 1614 (Fed. Cir. 1999), the Federal Circuit warns of a "hindsight trap." In this regard, the court stated that "Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight." It is submitted that evidence of a suggestion, teaching or motivation to combine Koizumi and Zhang is lacking and that their combination still would not meet the limitations of the claims now pending.

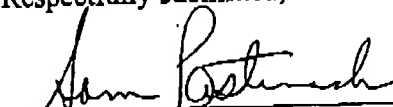
Dependent claims 156, 159 and 160 depend from independent claim 148 and are allowable for the reasons set forth above with respect to claim 148. Dependent claim 190 depends from independent claim 188 and is therefore also allowable. Similarly, independent claims 161, 164, 167 and 187 are allowable for the reasons set forth above in connection with the teachings of Koizumi and Zhang.

It is noted that claims 150-151 have been objected to as being dependent upon a rejected

base claim but would be allowable if rewritten into independent form including all the limitations of the base claim and any intervening claims. The applicant reserves the right to rewrite these claims at a later stage in this prosecution if necessary.

For the foregoing reasons, it is submitted that the pending claims are in condition for allowance and a notice of allowance to that effect is respectfully requested.

Respectfully submitted,

  
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